

REMARKS

This amendment is being filed along with a Request for Continued Examination (RCE) in response to the final Office Action having a mailing date of January 25, 2008. Various claims are amended as shown. No new matter has been added. With this amendment, claims 1-18, 20-43, 45-55, and 58-62 are pending in the application.

I. Discussion of the claims and cited references

The final Office Action rejected claims 1-10, 13-15, 21, 23, 24, 26-35, 38-40, 46, 48, 49, 51-55, 58-60 and 62 under 35 U.S.C. § 103(a) as being unpatentable over Cho (U.S. Patent No. 6,436,100) in view of Maeda (U.S. Patent No. 5,341,441). Claims 11-12, 36-37, and 61 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Cho and Maeda and further in view of Lee (U.S. Patent No. 5,731,836). For the reasons set forth below, these rejections are respectfully traversed, and it is kindly requested that the rejections be reconsidered and withdrawn.

A. Independent claim 1

Independent claim 1 as amended herein clarifies that the same quantization step is applied to all of the pixels in each block, by reciting “wherein each of said blocks is quantized with a same said quantization step.” It is respectfully submitted that this limitation is not disclosed, taught, or suggested by any of the references, whether singly or in combination.

For example, page 4 of the final Office Action admitted that “Cho is silent on the specific operation of the quantizer.” Maeda fails to supply the missing teachings of Cho.

Maeda provides a technique in which orthogonally transformed pixel values are quantized with individual quantization steps, which is in contrast to the recitations of claim 1 that require the same quantization step. Specifically, Maeda provides the following description on his column 10, lines 1-21 (emphasis ours):

“In a case where the image data has been orthogonally transformed, the positions of sequency components (Y_{ij}) (FIG. 2) having large values in a block change depending upon the image characteristics. For example, in

case of image data having a steep edge in the vertical direction, a large sequency component (power) concentrates in the shaded portion shown in FIG. 4B. Similarly, a large sequency component concentrates in the shaded portion shown in FIG. 4C in case of image data having a steep edge in the horizontal direction of the image data, and a large sequency component concentrates in the shaded portion shown in FIG. 4D in case of image data having a steep edge in the diagonal direction of the image data. In addition, power concentrates solely in the low-frequency portion, as shown in FIG. 4A, with regard to an image which does not contain an edge portion. In this embodiment, an inputted image block is sorted into one of these four classes and the blocks are independently vector-quantized, as shown in FIG. 4, thereby raising the efficiency of vector quantization.”

Therefore, it is apparent from the above-cited passage of Maeda that his technique analyzes orthogonally transformed image data, and assigns classes to the picture block. According to the class assigned to the complete block, the orthogonally transformed values are quantized with individual quantization steps by Maeda (“independently vector-quantized”). Generally, Maeda’s technique quantizes the frequency components of the orthogonally transformed values, which are indicative of edges, with lower resolution compared to the DC components (as shown in Figure 6 of Maeda). In fact, it seems that DC components are quantized by Maeda with a fixed quantization resolution (*see e.g.*, Figure 7 of Maeda showing that the DC components have 6 bits) and the frequency components are quantized according to the selected class. That is, it appears that in Maeda’s technique, a complete image block is quantized with a fixed number of bits having 6 bits for the DC component and 32/16/12 bits for the frequency components.

In contrast, one embodiment provided by the present applicants analyzes the pixel data of a block and determines a single sharpness value for the complete block (*e.g.*, from the highest and lowest luminescence value). This sharpness value is used to associate a certain class

to the complete picture block and according to this class, all pixel data are quantized with the same quantization step.

Furthermore, it is respectfully submitted that using a single/same quantization step in the technique of Maeda would be inefficient to his technique. Specifically, in the case of a quantization of the orthogonally transformed image data, compression is achieved by quantizing high frequency components with lower resolution. It is completely unclear how a single quantization step in his technique would have to be chosen in the presence of edges without decreasing significantly image quality or compression rate. Consequently, such a modified technique in Maeda, in which the same quantization step is used for the pixels in each block, cannot be understood as being disclosed, taught, or suggested by Maeda.

Accordingly, neither Cho nor Maeda meet the limitations of claim 1 that require “wherein each of said blocks is quantized with a same said quantization step.” As such, claim 1 is allowable.

Claim 1 as amended herein contains other limitations pertaining to the quantization that are not met by the references. For example, claim 1 has been amended to recite, *inter alia*, “repeated application in a spatial domain of a scalar quantizer to the pixels, which are in the spatial domain, of said blocks with a quantization step determined in an adaptive way according to characteristics of the pixels in the spatial domain.”

In explaining the present rejection of claim 1, page 3 of the final Office Action admitted that Maeda performs quantization on transformed blocks, but nevertheless asserted that the previously presented claim language was insufficient to distinguish over Maeda, stating the following (emphasis ours):

“The claim further does not require the repeated application of a scalar quantizer to be performed directly to the pixels of the blocks, as suggested by the Applicants. Thus, Maeda teaches repeated application of a scalar quantizer to the pixels of the blocks indirectly since the quantizer is performed on the transformed blocks.”

To more precisely address the above-position taken by the final Office Action that the quantization is not recited in claim 1 as being performed directly on the pixels, claim 1 is amended as shown to clarify that the quantization is applied to the pixels in the spatial domain. Therefore, such language in claim 1 distinguishes over Maeda's technique that performs quantization on transformed (Hadamard-transformed) points—this quantization of Maeda is clearly not being performed in the spatial domain. A detailed explanation of Maeda's technique to perform quantization on transformed points is provided on pages 18-19 of the previously filed amendment/response, which for the sake of brevity is not repeated herein.

It is noted that the final Office Action has cited column 12, lines 47-57 of Maeda as allegedly teaching direct application of a quantizer to pixels, and used this interpretation as a basis for rejecting claim 1. This interpretation of Maeda is traversed herein—Maeda cannot be interpreted as making obvious a direct application of a scalar quantizer having the features recited in claim 1 as amended herein.

In particular, Maeda discloses that image data can be subjected to multistage vector quantization directly without applying an orthogonal transformation only under certain conditions. For example, column 12, lines 47 to 63 of Maeda disclose that the scalar quantizer uses a fixed quantization step, which is not determined in an adaptive way as recited in claim 1. His image quality can only be controlled by means of the subsequent stages 61-67 by selecting the codes in each stage, namely the 32 bits of the first stage, the 16 bits of the second stage or the 12 bits of the third stage, by means of the selector 80.

Consequently, Maeda fails to disclose, teach, or suggest the possibility of using a quantization step which is determined in an adaptive way without having the information from the orthogonal transformed image data, or more specifically, Maeda fails to meet the limitation of "a quantization step determined in an adaptive way according to characteristics of the pixels in the spatial domain."

Accordingly, claim 1 is further allowable over the cited references, whether singly or in combination.

B. Independent claims 26, 51, and 58

Independent claims 26, 51, and 58 are amended in a manner generally similar to claim 1, and are allowable for reasons analogous to those provided above.

C. Allowable subject matter

The final Office Action indicated that dependent claims 16-18, 20, 22, 25, 41-43, 45, 47, and 50 would be allowable if rewritten in independent form. The Examiner is thanked for this indication of allowable subject matter.

These dependent claims are not yet being rewritten in independent form herein, since it is believed that their base independent claims are allowable. However, it would be appreciated if the Examiner continues to provide opportunities to rewrite claims having allowable subject matter into independent form, in the future, if the rejections of the independent claims continue to be maintained. The Examiner's cooperation in this regard would be very much appreciated.

II. Conclusion

Overall, none of the references singly or in any motivated combination disclose, teach, or suggest what is recited in the independent claims. Thus, given the above amendments and accompanying remarks, the independent claims are now in condition for allowance. The dependent claims that depend directly or indirectly on these independent claims are likewise allowable based on at least the same reasons and based on the recitations contained in each dependent claim.

If the attorney of record (Dennis M. de Guzman) has overlooked a teaching in any of the cited references that is relevant to the allowability of the claims, the Examiner is requested to specifically point out where such teaching may be found. Further, if there are any informalities or questions that can be addressed via telephone, the Examiner is encouraged to contact Mr. de Guzman at (206) 622-4900.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

All of the claims remaining in the application are believed to be allowable.
Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,
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